

Case 3560***Plateosaurus engelhardti* Meyer, 1837 (Dinosauria, Sauropodomorpha): proposed replacement of unidentifiable name-bearing type by a neotype**

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Abstract. The purpose of this application, under Article 75.5 of the Code, is to conserve the usage of the name *Plateosaurus* Meyer, 1837 (Upper Triassic, Germany), known from numerous articulated skeletons, several with complete skulls, from the Norian *Plateosaurus* bonebeds of Western Europe and Greenland. This was the first non-English, non-avian dinosaur and the second sauropodomorph and Triassic dinosaur to be named. It is proposed to replace the fragmentary and non-diagnostic bones that constitute the type material of *Plateosaurus engelhardti* Meyer, 1837, the type species of *Plateosaurus* Meyer, 1837, with a diagnostic neotype, an almost complete skull and skeleton (SMNS 13200). This specimen has formed the basis for the concept of *P. engelhardti* (the best represented basal sauropodomorph) and ultimately of *Plateosaurus* Meyer, 1837. *Plateosaurus* is the basis for PLATEOSAURIDAE Marsh, 1895 and Plateosauria Tornier, 1913.

Keywords. Nomenclature; taxonomy; Dinosauria; Sauropodomorpha; *Plateosaurus*; *P. engelhardti*; Upper Triassic; Germany; France; Switzerland; Greenland.

1. During the summer of 1834, Johann F.P. Engelhart discovered fossil bones near Heroldsburg near Nüremberg, Bavaria, Germany (probably from a clay pit at the Buchenbuhl on the Haidberg; Moser, 2003), in the upper conglomeratic horizon of the Upper Triassic Trossingen Formation. On 19 September 1834 Engelhart exhibited these bones at a congress of German natural scientists in Stuttgart (Engelhart, 1835; Anon., 1835). Christian E.H. von Meyer, one of the attendees at this congress, studied them and subsequently named them *Plateosaurus engelhardti* Meyer, 1837 (p. 316). This original spelling of the specific name is the correct one because Meyer (1837) cited the discoverer's name as Engelhardt (Article 32 of the Code); '*engelharti*' of later authors, beginning with Meyer (1839, p. 77), is an incorrect subsequent spelling (Article 33.3). For a comprehensive discussion of this point, and of the derivation of *Plateosaurus* (plate, Greek, broad area, so 'broadway lizard' not 'flat lizard', Schmidt, 1938, p. 134), see Moser (2003, pp. 13–14, English summary, p. 160).

2. The relevant section of Meyer (1837) was translated by Huxley (1870, pp. 38–39; also Weishampel & White, 2003, p. 159), who first recognized it as a dinosaur. The brief report of Meyer included the locality (Nüremberg) and the horizon (Upper Keuper), features excluded as indications by Article 12.3, and that the material consisted of nearly complete vertebrae and long limb bones (i.e. long bones of the

limbs, not limb bones that are long). He emphasized that the bones ‘come from one of the most gigantic Saurians, which, in light of the heaviness and hollowness [‘Schwere und Hohlheit’] of its limb bones, is related to the *Iguanodon* and *Megalosaurus*, and belongs to the second division of my Saurian system’ (see Meyer, 1832). In this context, heaviness and hollowness, although not diagnostic, are taxonomic characters and thus possibly qualify as a description that makes both the generic and specific names available under Article 12.2.6. Meyer (1839, p. 77) definitely provided a definition of both taxa in the sense of Article 12.2.6 when he mentioned the presence in *Plateosaurus engelharti* [sic] (incorrect subsequent spelling) of a ‘so called cross- or holy-bone [sacrum] originated by fusion of at least three vertebrae, something that is so far entitled only for mammals and is outrageous for a saurus!’ (translation, see Moser, 2003, p. 160). In two later works, Meyer (1841, 1845) mentioned a few vertebral features and included *Plateosaurus* in his Pachypodes (= Dinosauria Owen, 1842), but this does not bear on the nomenclature of the genus and species.

3. The bones from near Heroldsburg were finally described and illustrated by Meyer (1855), who neither in that work nor in his earlier ones indicated whether he considered them to represent one or several individuals. Again without speculating on the number of individuals, Blankenhorn (1898) described the type material at the Universität Erlangen-Nürnberg, Institut für Paläontologie, Germany (UEN) by reference to the figures and description of Meyer (1855). Huene (1908) re-described the material and, based on comparisons with more complete referred skeletons of *Plateosaurus*, excluded three bones as representing a larger individual than the rest. He noted that ‘die übrigen Knochen scheinen einer einzigen Art und wohl auch einen einzigen Individuum anzugehören’ [(the other bones seem to belong to a single species and probably also a single individual), Huene, 1908, p. 68]. His actions are most easily interpreted as the exclusion of extraneous components from an inferred holotype (Article 73.1.5), even though each bone has a separate specimen number with ‘3’ for parts of the femur. Two further skeletal elements were excluded by Galton (1984a, see also Moser, 2003) on grounds of actually being a dermal scute of a proganochelyid turtle and a proximal metatarsal of a theropod dinosaur. Galton (1984a, p. 139, after exclusions; also Weishampel & Chapman 1990, p. 50) referred to the ‘holotype’ of *Plateosaurus engelhardti*, and subsequently noted that the ‘holotype of *Plateosaurus engelhardti* Meyer, 1837 consists of fragmentary postcranial bones’ (Galton, 1997, p. 674; also 2000, p. 236; 2001a). Galton (2000, 2001b) later took a different view, listing the separate skeletal fragments as syntypes, as did Yates (2003). Because the bones were found in a conglomerate, show signs of wear and thus were probably reworked, and display unsuitable proportions between bone pairs, Moser (2003) concluded that no two bones belong to the same individual. Consequently, he designated a ‘lectotype’, the partial sacrum (UEN 552), and seven ‘paralectotype’ bones. Moser (2003) can perhaps be viewed as having further restricted the holotype to the sacrum alone (Article 73.1.5). The precise type status of the original material of *P. engelhardti* will become moot if the proposals in paragraph 14 herein are approved, so the point is not belaboured further here.

4. Rüttimeyer erected *Gresslyosaurus ingens* Rüttimeyer, 1856 (p. 64) based on fragmentary postcranial bones from the Upper Triassic of Niederschönthal, near Basel, Switzerland. Among the bones still available at the Naturhistorisches

Museum, Basel, Switzerland (Huene, 1908; Galton, 1986) is an incomplete sacrum, the form of which (Moser, 2003) indicates that this is a distinct species (Yates, 2007, 2010). This species was first included in *Plateosaurus* by Galton (1986).

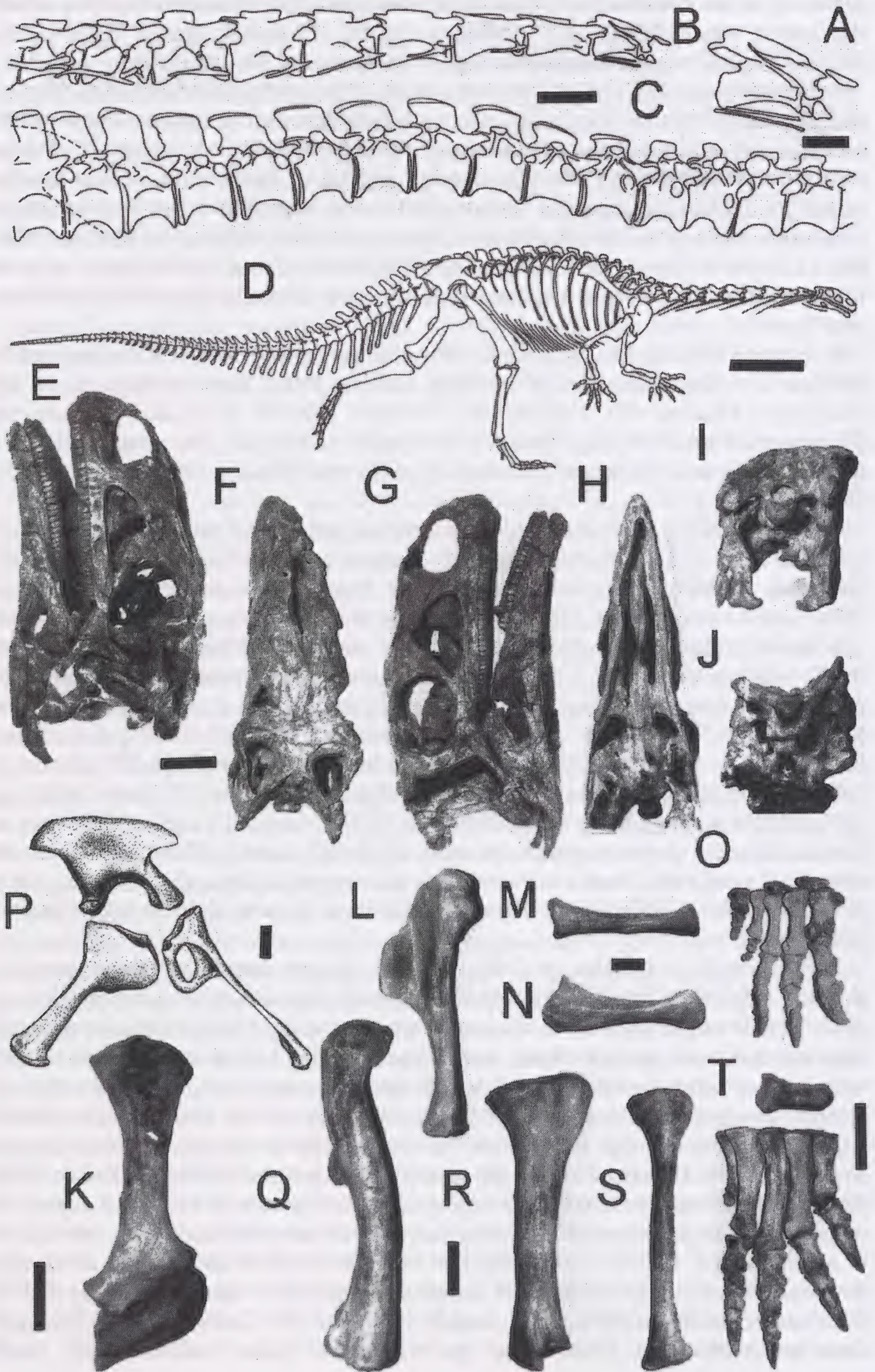
5. Between 1862 and 1932, numerous species (some originally described in different genera) were referred to *Plateosaurus* from the adjacent part of France (Huene, 1908; Galton, 1998) and other parts of Germany (see Galton, 2001a). However, 15 of these taxa are nomina dubia or were incorrectly referred to *Plateosaurus*. These species, which are discussed in detail by Galton (2001a, summary 2001b; see Weishampel & Chapman, 1990, tabs 3.1–3 for earlier referrals and synonymies; also Galton, 1990, tab. 15.1), will not be considered here, just those that are based on diagnostic material that could plausibly serve as a neotype to replace the current holotype of *Plateosaurus engelhardti*.

6. Huene (1905, p. 346) provided a non-illustrated description of an incomplete skeleton as *Plateosaurus erlenbergensis* Huene, 1905. The holotype is in the Staatliches Museum für Naturkunde, Stuttgart (SMNS 6014) and is from the Trossingen Formation of Erlenberg, Germany; it includes an incomplete skull (palate, jaw bones, braincase) and various postcrania (Huene, 1908; Galton, 1985a, 2001a).

7. Huene (1908, p. 178) described an incomplete postcranial skeleton (SMNS 5717) from the Late Triassic lower Löwenstein Formation (Middle Keuper) of Heslach, Germany, as *Sellosaurus gracilis* Huene, 1908. Huene (1926) referred this species to *Plateosaurus*, as *P. gracilis* (Huene, 1908), and it is a distinct species (Yates, 2003).

8. Jaekel (1913–14) reported the discovery of numerous articulated skeletons from the Trossingen Formation a little south of Halberstadt, Germany. The holotype of *Plateosaurus longiceps* Jaekel, 1913 (June, pl. 3) is now just a complete skull in the Museum für Naturkunde – Leibniz Institute for Research on Evolution and Biodiversity at the Humboldt University, Berlin, Germany (MB R.1937, formerly field number HMN 24) that was subsequently prepared free of matrix (Galton, 1985a, 2001a; Galton & Kermack, 2010, figs. 9F–H). Originally the holotype was an almost complete skeleton, except for most of the tail (Jaekel, 1913, fig. 2), and the associated postcranial bones (18 vertebrae, sacrum with pelvic girdle, femur, tibia, fibula, scapula) mentioned by Huene (1932) have been mislaid or lost (Galton, 2001a).

9. Fraas (1913, November, p. 1100) reported the discovery of an almost complete skeleton (SMNS 13200, Fig. 1), which he named *Plateosaurus trossingensis* Fraas, 1913. This holotype came from the lower bone bed at the Obere Mühle (upper mill) location at Trossingen, Germany (see Schoch, 2011). The stratigraphic level falls within the uppermost unit of the Middle Keuper sequence, but lithologically the bed clearly belongs to the Trossingen Formation (Schoch, 2011). The holotype (SMNS 13200) of *P. trossingensis* is the basis for the objective junior synonyms *P. integer* Fraas in Huene, 1915 (p. 3, no reason given) and *P. fraasianus* Huene, 1932 (p. 140). The latter species was erected to replace *P. trossingensis* Fraas, 1913 which he considered to be a nomen nudum because it was erected without either a description or an illustration. However, as Galton (2001a, p. 481 for English summary of relevant details) noted, Fraas (1913, p. 1100) includes enough information concerning SMNS 13200 to meet the conditions of Article 12.2.6 of the Code. SMNS 13200 was described in detail as *Plateosaurus* sp. by Huene (1926). Analyses of the skulls



(Galton, 1984a, 1985a; as *P. engelhardti*) and femora (Weishampel & Chapman, 1990; as *Plateosaurus* sp.) in the lower bone level at Trossingen showed that only one species is present, contra Huene (1932).

10. Other specimens from Switzerland and Greenland represented by partial, nearly complete, or articulated skeletons have been assigned to *Plateosaurus engelhardti* by Galton (1986), Sander (1992), and Jenkins et al. (1995). Furthermore, all the plateosaurid taxa from France, Germany and Switzerland were listed as junior synonyms of *Plateosaurus engelhardti* Meyer, 1837 by Galton (1990, tab. 15.1). Contrary to this, based on the supposed difference in the form of the sacra compared to that of *P. engelhardti* (UEN 552), Galton (2001a) referred the French, Swiss and German material (except UEN specimens) to *P. longiceps* as the next available species based on diagnostic material, with *P. trossingensis* as a junior synonym (also Galton & Upchurch, 2004; Sereno, 2007). Prieto-Márquez & Norell (2011) agreed but used the older name *P. erlenbergiensis* Huene, 1905 (with *P. longiceps* and *P. trossingensis* as junior synonyms) instead for the remaining German specimens. However, Moser (2003) showed that the sacra are in fact all similar and regarded all the German species of *Plateosaurus* as junior synonyms of *P. engelhardti*. In fact, Moser's (2003) so-called lectotype of *Plateosaurus engelhardti*, the sacrum UEN 552 (photographs Galton, 2000; Moser, 2003) is readily distinguishable from the sacra of the holotypes of *P. gracilis* (Galton, 1984b, 1999; Yates, 2003) and *P. ingens* (Huene, 1908; Galton, 1986; Moser, 2003) but indistinguishable from the Halberstadt sacra referred to *P. longiceps* and the Trossingen sacra, including SMNS 13200, referred to *P. trossingensis* (Moser, 2003; more photographs in Galton, 2001a). Two alternative classifications are thus current. Yates (2007, 2010; also Apaldetti et al., 2011) have recognized three valid species of *Plateosaurus*, with the older *P. gracilis* as the sister group to the more recent *P. engelhardti* and the Swiss *P. ingens*. On the other hand, Galton & Kermack (2010) recognized *P. gracilis* and *P. ingens* but, based on differences in the pterygoid medial process of MB R.1937 is broad, flattened and separated from main body by a deep notch (Barrett & Yates, 2006; Galton & Kermack, 2010) but in SMNS 13200 it forms a semi-circular medial process that wraps hook-like around the basiptyergoid process (Galton, 1984a, 1985a); also the part of the sinuous ridge adjacent to the postero-medial process forms a second prominent semicircular flange in MB R.1937 but not in SMNS 13200], considered *P. longiceps* and *P. trossingensis* to be valid species (also with differences in length of epiphyses of cervical vertebrae 2–6: elongate spikes in Trossingen specimens but rounded knobs in Halberstadt specimens, see Yates, 2003) with *P. engelhardti* as a nomen dubium (as also *P. erlenbergiensis*).

Fig. 1. SMNS 13200, proposed neotype for *P. engelhardti* Meyer, 1837, from the Upper Triassic of Trossingen, Germany. (A–C) vertebrae in right lateral view: (A) atlas and axis; (B) as A with cervicals 3–10 and (C) dorsals 1–15. (D) skeletal reconstruction in running pose, body length about 6.5 m. (E–G) skull and mandible in: (E) left lateral; (F) dorsal and (G) right lateral views. (H–J) skull in: (H) ventral; (I) posterior and (J) posteroventral views. (K–T) right girdle and limb bones in lateral (K, M, N, P–S), medial (L) and dorsal (anterior) views (O, T): (K) scapula and coracoid; (L) humerus; (M) radius; (N) ulna; (O) manus; (P) pelvic girdle; (Q) femur; (R) tibia (left reversed); (S) fibula and (T) astragalus (left reversed) and pes. A–D modified from originals used in Galton (1990), after Huene (1926); E–J modified from originals used in Galton (1984a); for labelled line drawings corresponding to E–J, see Huene (1926) and Galton (1984a). Scale bars represent 50 mm (A, E–J), 100 mm (B–C, K, L–O, P, Q–S, T) and 500 mm (D).

11. *Plateosaurus* is the best represented and best known genus of basal sauropodomorph dinosaur, remains of which are known from over 40 localities in western Europe and Greenland. The situation outlined in the preceding paragraph, concerning the lack of universality regarding valid specific names, requires an identifiable neotype for resolution. Meyer's (1837) description of *Plateosaurus engelhardti* was vague and non-diagnostic; despite this fault, both the generic and specific names have been universally attributed to this work. Some may judge that these few words are too meagre to constitute a 'description' for the purposes of Article 12.2.6; but if the attribution of the name is switched to Meyer (1839), based on the clearly diagnostic feature for the genus and species presented there, viz., a three-vertebrae sacrum, then the specific name will become *engelharti*, as Moser (2003) has shown. This would be potentially confusing and not conducive to universality. Yates (2003, p. 331), noting that the 'syntypes' of *P. engelhardti* are inadequate for diagnosis, remarked that 'the excellent skeleton from Trossingen, SMNS 13200, has formed the basis for the concept of *Plateosaurus* ever since Huene (1926) published his description of it. Here I treat SMNS 13200 as the unofficial holotype of *Plateosaurus engelhardti*, while recognizing that this decision will need to be ratified by the ICZN.'

12. Specimen SMNS 13200 is the basis for the figures of the bones of *Plateosaurus* species in Galton (1990), Galton & Upchurch (2004) and Heerden (1997); Moser (2003) gave photographs of the vertebral column, shoulder girdle and ilium plus stereo photographs of the humerus, femora and tibiae. The complete matrix-free skull (Figs. 1E-J) was illustrated with stereo photographs as preserved (Galton, 1984a, 1985a, b, 2001a, b) and reconstructed in several different views (Romer, 1956, 1966; Galton, 1985a, 1990, 2001b; Carroll, 1988; Heerden, 1997; Wilson & Sereno, 1998; Yates, 2003, 2012; Galton & Upchurch, 2004; Benton, 2005; Sereno, 2007; Paul, 2010). The restoration drawing by Huene (1926) of the skeleton in a bipedal pose has been copied (e.g. Lapparent & Lavocat, 1955; Huene, 1956; Romer, 1956, 1966; Moser, 2003) or modified to a dynamic running pose with the column held more horizontally (Fig. 1D; Weishampel & Westphal, 1986; Galton, 1990, 2000, 2001a, b; Paul, 1997, 2010; Heerden, 1997; Upchurch, 1997; Moser, 2003; Yates, 2003, 2012; Galton & Upchurch, 2004). Consequently, the very well illustrated, associated and nearly complete skeleton SMNS 13200 is the obvious choice for designation as the neotype to replace the inadequate holotype, the sacrum UEN 552, of *Plateosaurus engelhardti*.

13. *Plateosaurus* Meyer, 1837 is the basis for PLATEOSAURIDAE Marsh, 1895 and Plateosauria Tornier, 1913. SMNS 13200 (Fig. 1) has formed the basis for the concept of *Plateosaurus* since its description by Huene (1926) and the basis for *P. engelhardti* since the description of its skull by Galton (1984a). Because the taxonomic identity of the nominal species of *Plateosaurus engelhardti* cannot be determined from its existing name-bearing type, and stability and universality are threatened thereby, the Commission is requested to use its plenary power under Article 75.5 to set aside the existing name-bearing type and designate SMNS 13200 as the neotype.

14. The International Commission on Zoological Nomenclature is accordingly asked:

- (1) to use its specific powers as granted by Article 78.2.3 to confirm that the generic name *Plateosaurus* and the name of its type species, *P. engelhardti*, are both available from Meyer (1837);

- (2) to use its plenary power to set aside all previous type fixations for the nominal species *Plateosaurus engelhardti* Meyer, 1837 and to designate specimen SMNS 13200 in the Stuttgart Museum für Naturkunde as the neotype;
- (3) to place on the Official List of Generic Names in Zoology the name *Plateosaurus* Meyer, 1837 (gender: masculine), type species by monotypy *Plateosaurus engelhardti* Meyer, 1837;
- (4) to place on the Official List of Specific Names in Zoology the name *engelhardti* Meyer, 1837, as published in the binomen *Plateosaurus engelhardti* and as defined by the neotype SMNS 13200 in the Stuttgart Museum für Naturkunde designated in (2) above.

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